ADEQ Criteria for evaluating applicability of water quality standards and designated uses for Appendix B waterbodies in Arizona

Introduction

The purpose of this document is to present the process by which the Arizona Department of Environmental Quality (ADEQ) evaluates whether Arizona water quality standards and designated uses are applicable to rivers, streams and lakes per the Clean Water Act (CWA).by. More specifically, this document describes the criteria by which ADEQ determines streams, lakes and wetlands to be "Waters of the US (WOTUS)" and subject to Clean Water Act (CWA) regulations. This guidance is based on the definition of navigable waters in the CWA and the guidance provided in the U.S. Environmental Protection Agency/U.S. Army Corps of Engineers (USEPA/USACOE) 2008 guidance memo entitled "Clean Water Act Jurisdiction Following the U.S. Supreme Court's Decision in Rapanos v. United States & Carabell v. United States." ADEQ has developed the additional criteria and guidance in this document to assist in desktop GIS determinations for waterbodies listed in Appendix B of the Arizona Water Quality Standards.

Since CWA jurisdiction is largely based on stream connections to traditional navigable waters (TNW) and relatively permanent waters (RPW), and since only four short reaches of Arizona's great rivers have been designated as TNWs by the USACOE, many Arizona streams are in jurisdictional limbo because they are not tributary to either of those jurisdictional waters. Clearly, there are other Arizona rivers that should be designated as TNWs based on current or historic navigability and water permanence. However, the USACOE has not conducted a comprehensive review of Arizona's large rivers as TNWs. We also know that the Colorado River is currently "navigable, in fact", although it is not listed as a TNW on the USACOE website. There are >400 waterbodies on Appendix B of Arizona's water quality standards which are in jurisdictional limbo. These waterbodies should not be disqualified or labeled as "not WOTUS" because they are non-perennial or have a distant connection to the currently listed four small segments of TNWs. Thus, we are including Arizona's large, "relatively permanent water" rivers in addition to the TNWs, as the downstream waterbody with which to demonstrate a significant nexus. The Arizona Large RPW Rivers include:

- Bill Williams River
- Colorado River
- Little Colorado River
- Gila River
- Salt River
- San Pedro River
- Santa Cruz River
- Verde River

The USACOE's significant nexus test includes identification of channel indicators of "bed, bank and ordinary high water mark (BBOHWM)" at the mouth of a tributary, as a primary diagnostic physical characteristic for a WOTUS. ADEQ has further clarified this criterion, adding that non-RPW streams should have BBOHWM indicators present for 50% of the channel length and BBOHWM indicators present at the confluence with the downstream waterbody, which flows either directly or indirectly to a downstream Large River RPW or TNW waterbody. This criterion was added to lend support to the identification of ephemeral waterbodies as an important hydrological, water quality, physical, biological and ecological linkages in the drainage network of downstream Large River RPWs and TNWs.

Studies have demonstrated the importance of non-perennial streams, as in the following:

- Intermittent and ephemeral streams comprise approximately 96% of the drainage network of stream miles across Arizona (Condon and Jones, 2016). These non-perennial streams provide the same hydrological and ecological functions as perennial streams by moving water, sediment and nutrients from the watershed to downstream RPW and TNWs. "When functioning properly, these streams provide landscape hydrologic connections; stream energy dissipation during high-water flows to reduce erosion and improve water quality; surface and subsurface water storage and exchange; ground-water recharge and discharge; sediment transport, storage, and deposition to aid in floodplain maintenance and development; nutrient storage and cycling; wildlife habitat and migration corridors; support for vegetation communities to help stabilize stream banks and provide wildlife services; and water supply and water quality filtering. They provide a wide array of ecological functions including forage, cover, nesting, and movement corridors for wildlife. Because of the relatively higher moisture content in arid and semi-arid region streams, vegetation and wildlife abundance and diversity in and near them is proportionally higher than in the surrounding uplands. Ephemeral and intermittent streams comprise a large portion of southwestern watersheds, and contribute to the hydrological, biogeochemical and ecological health of a watershed (Levick et al., 2008)."
- Periodic flows in intermittent and ephemeral channels have a strong influence on biogeochemistry by providing a connection between the channel and other landscape elements (Valett et al., 2005). These stream types are driven by pulse inputs of water, sediment, organic matter, and other materials during rain events. These episodic events are important for transmitting a substantial amount of material into downstream perennial waters (Nadeau and Rains, 2007).
- Presence of a riparian corridor or riparian plant species (Stromberg et al, 2009) that are distinct from upland plant species are an important biological indicator. "Vegetation in ephemeral stream channels plays a key role in resource retention by protecting soils from wind and water erosion, slowing floodwater velocity, and moderating temperatures. Ephemeral stream vegetation also influences biogeochemical cycles by providing leaf litter, and food and cover for wildlife (Levick et al, 2008)." "Vegetation structure and diversity determine wildlife species diversity and abundance, and if a portion of habitat on which a species depends is damaged or destroyed, the breeding population of that species could be lost (Anderson and Ohmart, 1977)." Riparian habitats created by intermittent and ephemeral streams in the arid Southwest provide important habitat for wildlife and about 80% of all animals use riparian resources and habitats at

some life stage and more than 50% of breeding bird species nest chiefly in riparian habitats (Krueper, 1993).

- "Ephemeral and intermittent stream channels provide important wildlife movement corridors in arid and semi-arid regions because they contain continuous chains of vegetation that wildlife can utilize for cover and food. In addition, during the summer monsoon season small floods create a more-or-less continuous corridor of water that allows dispersal of herpetofauna such as garter snakes and amphibians, which are active during the summer. This dispersal mechanism allows genetic interchange between subpopulations that are isolated for most of the year, and allows recolonization of sites where subpopulations may be lost due to drought or disturbance (Levick et al., 2008).
- Ephemeral streams contain rich assemblages of both invertebrates and macroinvertebrates. Kingsley (1998) conducted an extensive survey of the invertebrates at Organ Pipe Cactus National Monument, Arizona, and found a very high species richness in the wash habitats in the Ajo Mountains and Aguajita Wash, with nearly 1000 taxa surveyed. Many invertebrates require a hydrologic connection for their spatial dispersal, even if the connection is ephemeral or intermittent (Nadeau and Rains, 2007). Disturbances caused by intermittent flows may actually facilitate high food quality and consequently high levels of insect production in warm temperate desert streams (Fisher and Gray, 1983; Jackson and Fisher, 1986; Grimm and Fisher, 1989; Huryn and Wallace, 2000). Many invertebrates require standing water for part of their life cycle. Some species live in sediment, either in encysted form, or within the hyporheic zone. Graham (2002) studied temporary pools in watercourses in Wupatki National Monument, Arizona and found 22 taxa of aquatic macroinvertebrates and two species of amphibians.
- There are seventy-five native fish species recorded in Arizona and New Mexico; many of them listed as endangered. Many native and non-native fish species are found in isolated perennial pools in otherwise ephemeral or intermittent streams. Four fish taxa were collected during a one year study on ephemeral streams in southern Arizona by URS Corporation (2006), including two native species. Native desert fish are adapted to the harsh and variable conditions of the desert; for example the desert Pupfish (*Cyprinodon sp.*) can withstand high temperatures, alkalinity, and salinity of small desert pools (Pister, 1995). Longfin dace (*Agosia chrysogaster*) can survive relatively high water temperatures and low water quality and quantity and have been found alive in moist algal mats where there was not enough water to swim (Hulen, 2007; Rinne and Minckley, 1991).

ADEQ Guidance

The ADEQ criteria for evaluating applicability of water quality standards and designated uses for Appendix B waterbodies is outlined in the following guidance. These criteria generally follow the USACOE/EPA post-Rapanos guidance memo entitled "Clean Water Act Jurisdiction Following the U.S. Supreme Court's Decision in Rapanos v. United States & Carabell v. United States," but also include the additional criteria for Large River RPWs and for examining channels for BBOHWM channel indicators at the mouth and in 50% of the reach. ADEQ conducted a desktop GIS evaluation of the 900+ waterbodies listed in Appendix B, utilizing the Corps' desktop GIS reconnaissance method for identifying the "ordinary high water mark (OHWM)" per the USACOE "Field guide to the identification of the Ordinary high water mark in the Arid West region of the Western US" (Lichvar and McColley, 2008). OHWM indicators visible in aerial photography include: 1) changes in vegetation density from the floodplain to the upland, 2) breaks in slope between the active floodplain and low terrace, and 3) texture associated

with reworked particles of the active floodplain based on color tone and brightness comparisons between the floodplain and adjacent terrace/uplands. The following outlines the WOTUS categories and the decision criteria for determining whether a waterbody is a WOTUS or not. The highlighted criteria are ADEQ criteria added for clarification during the desktop GIS evaluations.

1. Waterbody is a WOTUS; automatically jurisdictional
    a. TNW's:
        i. Gila River (Gila county) Coolidge Dam to Winkelman – perennial due to releases from dam, 2008
        ii. Lower Gila River – 6.9 mi reach of Lower Gila River in Maricopa county: Powers Butte to Gillespie Dam, 2008
        iii. Santa Cruz River – Tubac gage station to Continental Gage station, 2008
        iv. Santa Cruz River – Roger Rd Wastewater Treatment Plant to Pima/Pinal County line, 2008
        v. Colorado River – currently navigable water
    b. Wetlands adjacent to TNWs
    c. Relatively Permanent waters (RPW) that flow directly or indirectly into TNWs
        i. Perennial in entirety (flow regime layer)
        ii. RPW, Perennial Segments in reach (flow regime layer)
        iii. RPW, >90days flow present (intermittent photo monitoring data)
        iv. Constructed (man-made or man-altered) channel with relatively permanent flow that directly or indirectly discharges to a RPW tributary or TNW (not applicable to agricultural drainage ditches in uplands)
        v. Documentation of WOTUS status by USACOE
        vi. Spring that is perennial and direct tributary to RPW (eg. Fossil Springs)
        vii. Lake that is within a RPW stream or is tributary to a RPW stream or other WOTUS
    d. Wetlands directly abutting RPW tributary that flow directly or indirectly into TNWs
    e. Impoundments of jurisdictional waters (eg. the above categories)

2. May be a WOTUS – Significant nexus test

The USEPA/USACOE Memorandum provides guidance for evaluating non-relatively permanent waters using a "significant nexus" analysis. The Guidance provides that "The agencies will assert jurisdiction over non-navigable, non-relatively permanent tributaries and their adjacent wetlands where such tributary and wetlands have a significant nexus to a traditional navigable water. A significant nexus desktop analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical and biological integrity of downstream waters." A tributary is considered a stream that is of only one stream order and can be a natural channel or man-altered or man-made waterbody, according to the USACOE JD Guidebook. The tributary and adjacent wetlands should have more than a speculative or insubstantial effect on the chemical, physical, and biological integrity of the downstream water. As the distance from the tributary to the navigable water increases, it will become increasingly important to document how the tributary and its adjacent wetlands have a significant nexus. The Memorandum specifically recognizes that ephemeral streams may meet the criteria for a non-relatively permanent water with a bed, bank and OHWM and serve some of the hydrologic and ecological functions listed below and thus be considered WOTUS. Application of the criteria listed below should

resolve a waterbody into a yes or no WOTUS decision. Note that "a natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction… where there is a break in the OHWM that is unrelated to the waterbody's flow regime…, the agencies will look for indicators of flow above and below the break (Lichvar and McColley, 2008)."

Significant nexus includes consideration of hydrologic factors including the following:

- volume, duration, and frequency of flow, including consideration of certain physical characteristics of the tributary, such as number of flow events/year
- proximity to the traditional navigable water
- size of the watershed
- average annual rainfall
- average annual winter snow pack
- Bed and banks present; OHWM indicators present including:
    a. Clear, natural line impressed on the bank
    b. shelving
    c. changes in character of the soil
    d. sediment deposition or sediment sorting
    e. abrupt change in plant community

Significant nexus also includes consideration of ecological factors including the following:

- Ability of tributary and adjacent wetlands to carry pollutants and flood waters to traditional navigable waters
- Provision of aquatic habitat that supports biota of a traditional navigable water
- Potential of wetlands to trap and filter pollutants or store flood waters
- Maintenance of water quality in traditional navigable waters
- Capacity to transfer nutrients and organic carbon vital to support downstream foodwebs (e.g., macroinvertebrates present in headwater streams convert carbon in leaf litter making it available to species downstream),
- Habitat services such as providing spawning areas for recreationally or commercially important species in downstream waters, and functions related to maintenance of downstream water quality such as sediment trapping.

Non-RPW Categories with significant nexus:

a. Non-RPW that flows directly or indirectly into TNWs
    - Non-RPWs with Bed, Bank, and OHWM indicators present at the mouth of the tributary and for 50% of the channel length; flows directly or indirectly to a Large River RPW or TNW
    - Non-RPW lake that is located within a tributary with Bed, Bank and OHWM (BBOHWM) indicators present at the mouth of the tributary and for 50% of the channel length; flows directly or indirectly to a Large River RPW or TNW
    - Constructed (man-made or man-altered) channel with non-relatively permanent flow that directly or indirectly discharges to a downstream Large River RPW tributary or TNW
b. Wetlands adjacent to but not directly abutting RPWs
c. Wetlands adjacent to non-RPW's

3. Not a WOTUS
    a. Streams:
        i. Swale or gully with no BBOHWM indicators
        ii. Agricultural drainage ditches in uplands
        iii. Channel permanently disconnected
        iv. Terminal Basin or waterbody that is tributary to a terminal basin such as Wilcox Playa. (In our search for terminal basins >100 acres we found 16 terminal lakes, of which only two are WOTUS. Also found only five streams that are tributary to terminal basins and are therefore not WOTUS. I also visually checked the tributaries /inlets to all 16 terminal lakes; any that were listed in Appendix B were relabeled as not WOTUS.)
    b. Lakes:
        i. Terminal lake; Has inlets but no outlet or connection to neighboring streams. Any streams that are tributary to the terminal lake are also not WOTUS.
        ii. Isolated lake; no inlets or outlets
        iii. Constructed urban lake, no discharge to a WOTUS and not adjacent a WOTUS

Literature Cited:

Stromberg JC, AF Hazelton, MS White, JM White, RA Fischer. Ephemeral wetlands along a spatially intermittent river: Temporal patterns of vegetation development. Wetlands (2009).

Levick, L., J. Fonseca, D. Goodrich, M. Hernandez, D. Semmens, J. Stromberg, R. Leidy, M. Scianni, D. P. Guertin, M. Tluczek, and W. Kepner. 2008. The Ecological and Hydrological Significance of Ephemeral and Intermittent Streams in the Arid and Semi-arid American Southwest. U.S. Environmental Protection Agency and USDA/ARS Southwest Watershed Research Center, EPA/600/R-08/134, ARS/233046, 116 pp.

Anderson, B.W., and R.D. Ohmart. 1977. Vegetation Structure and Bird Use in the Lower Colorado River Valley. *In:* Importance, Preservation and Management of Riparian Habitat: A Symposium, July 9, 1977. U.S. Forest Service General Technical Report RM-43, p. 23-34.

Krueper, D.J. 1993. Conservation priorities in naturally fragmented and human-altered riparian habitats of the arid West. USDA Forest Service. General Technical Report RM-43. Available online: [HYPERLINK "http://www.birds.cornell.edu/pifcapemay/krueper.htm"].

Levick, L.R., D.J. Semmens, D.C. Goodrich, W. Kepner, J. Brush, R.A. Leidy, E. Goldmann. 2006. Simulated Changes in Runoff and Sediment in Developing Areas Near Benson, Arizona (in press).